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PATENT SPECIFICATION

DRAWINGS ATTACHED

1,107,628

1,107,628

Date of Application and filing Complete Specification: 22 June, 1965.
No. 26354/65.
Application made in United States of America (No. 391920) on 25 Aug., 1964.
Complete Specification Published: 27 March, 1968.

Index at acceptance: —B5 A(1G3B, 1G7AX, 1R20, 8); B8 D(1A1, 7PY)

Int. Cl.: —B 29 f 3/04

COMPLETE SPECIFICATION

Improvements in and relating to the Formation of Plastics Containers

We, MONSANTO COMPANY, a Corporation organised and existing under the Laws of the State of Delaware, United States of America, of 800 North Lindbergh Boulevard, St. Louis, Missouri, 63166, United States of America, do hereby declare the invention for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates generally to a new and useful method and apparatus for forming a plastics parison which may be expanded to form a container and more particularly to a method and apparatus for extruding a parison which is used in producing receptacles having enhanced beauty and greater strength.

Plastics container manufacturers are making increasingly greater inroads into fields normally occupied by the glass and paper industries as more economical and more efficient techniques become available in fabricating containers from this material. Container manufacturers are, however, constantly striving to produce a receptacle which will have enhanced sales appeal. Containers of this nature, however, generally acquire sales appeal only at the sacrifice of some other desirable property or attribute, such as economical fabricating techniques. It has now been discovered that a container having increased strength and enhanced aesthetic appeal can be manufactured without the necessity of resorting to more expensive techniques and with only nominal modifications of existing equipment.

It is therefore an object of this invention to provide a method and apparatus for forming a receptacle or the like, possessing an unusual rib-like optical effect.

It is a further object of this invention to provide a method and apparatus for strengthening the walls of a container through the use of a series of circumferentially spaced ribs positioned along the walls of the receptacle.

It is a further object of this invention to provide a receptacle having enhanced sales appeal resulting from a visual effect caused by a varying wall thickness pattern in the receptacle.

These and other objects will become apparent from the following description when read in conjunction with the accompanying drawings.

In describing the overall invention, reference will be made to preferred embodiments of the apparatus illustrated in the accompanying drawings, in which:

Figure 1 is a sectional, elevational showing of a preferred embodiment of an extrusion apparatus.

Figure 2 is a sectional, elevational and schematic showing of the extrusion outlet portion of Figure 1 and an accompanying blow mold.

Figure 3 is a sectional elevational schematic showing of a preferred embodiment of a blow mold in closed position.

Figure 4 is a sectional elevational showing of the extrusion outlet portion of a modified form of Figure 1.

Figures 5(a) and 5(b) are sectional elevational showings of the extrusion outlet portion of another modified form of Figure 1.

Figures 6 to 14 are cross sectional parison views illustrating varying forms and shapes of parisons made in accordance with this invention.

Figure 15 is an illustration of one form of container made in accordance with this invention.

The extrusion apparatus illustrated in Figure 1 includes a conventional hopper 1

[Pr.

for supplying bulk plastic material to a schematically illustrated conventional plasticizer and feeding unit 2. Plasticizing unit 2 includes a material inlet 3, an elongate passage 4, a plastic material advancing and pressuring worm screw 5, and an outlet 6. Unit 2 would be surrounded with conventional heating units, not illustrated, to effect the plasticizing of material being advanced through passage 4 by screw 5.

Outlet 6 terminates in an adjacent outlet 7 which communicates with the interior of the parison-forming unit 8. Parison-forming unit 8 includes a generally vertically extending bore 9 communicating with outlet 7. Mandrel 10 is mounted within bore 9 so as to define an annular cavity. At the lower end of the illustrated mandrel 10, there is mounted an extrusion tip 11 which provides an inner surface of a parison defining outlet. An extrusion ring 12 is spaced from the tip 11 defining the outer surface of this extrusion outlet.

Tip member 11 has a downwardly facing generally convex surface 11(a). Ring member 12 includes an upwardly facing generally concave surface 12(a). An opening 13 extends from concave portion 12(a) in axial alignment with the tip. Plastic material extruded through the apparatus and passing through the extrusion outlet defined by the tip 11 and the ring 12 will issue from the opening 13 in the form of a hollow parison in the conventional manner recognized in the art. Extrusion ring 12 is characterized in this particular embodiment by a series of circumferentially spaced axially extending protrusions 14. These protrusions, conversely, impart circumferentially spaced axially extending grooves 16 to the parison along its outer periphery, as illustrated in Figure 2.

Reviewing the apparatus in overall perspective, it will be appreciated that at the left end of illustrated screw 5 there is provided a source of plastic material. At the opposite ends of the apparatus, an extrusion outlet is defined by cooperating ring 12 and tip 11. Plasticizer passage 4, connecting passage 7 and the annular passage encircling mandrel 10 afford a continuously open feed cavity for maintaining communication between the plastic material being fed and the extrusion outlet 13.

The extruded, grooved parison, a cross-section of which is illustrated in Figure 6, is then introduced into a suitable mold for formation into a useful article. In the particularly preferred embodiment illustrated in Figure 2, the parison is transferred between open mold members to the position illustrated. Thereafter, the mold members 18(a) and 18(b) are closed, and a cut-off or shearing blade 17 adapted to move transversely across the outer end of the cavity severs the connection between the plastic in the mold and the extrusion outlet. The mold is closed about the parison while pinching in the joint thereof, the exteriorly projecting portion of the parison. The pinched parison is thereafter blown by air pressure into surface contact with the mold cavity walls as illustrated in Figure 3. This type of operation is well known in the art and is subject to many variations in the type of blowing technique employed, as well as in the particular series of sequential operations performed upon the parison in blow molding the parison into a finished article. Reference may be made to U.S. 2,669,752, and to British Patent No. 667163, also to U.S. 2,975,473, and U.S. 2,597,558 in this regard.

One example of a finished receptacle is illustrated in Figure 15, and consists of a top wall having an upstanding tubular neck, a bottom wall and a side wall; the walls being characterized by a series of rib-like circumferentially spaced grooves extending from the neck to the bottom wall. The exterior walls of the container will, in many instances, feel essentially smooth to the touch in portions wherein the parison undergoes substantial stretching during the blowing operation, although the ribs are still clearly visible. This effect is caused by the pressure of the air or other fluid medium used to blow the parison against the mold cavity. Thus even though the ribs may be present only on the outside of a parison formed in the manner illustrated in Figure 2, the ribs will appear on the inside of the finished container, except in those areas in which there is practically no blow up of the parison, such as the neck area, for example. The alternating ribs, due to different angles of light reflection, produce a visual effect of alternating shades of the primary color, although obviously the parison used to produce this effect is but one color throughout. As a result of this unusual optical effect, the finished receptacle emanates a quality of luxury not generally associated with synthetic plastic containers, and one which is achieved at a virtually negligible cost increase over plastic containers presently available.

Figure 4 illustrates a modification of the embodiment illustrated in Figure 1 wherein both the ring member 12 and the tip member 10 have circumferentially spaced axially extending grooves. As becomes readily apparent, grooves 19 spaced along tip 11 will impart a series of spaced ridges to the inner periphery of the parison, as illustrated in cross section in Figure 7. This parison, when molded by a technique such as that shown in Figures 2 and 3, will form a receptacle having a rib-like configuration extending along the length of the container from the neck portion, along the side walls

and to the bottom portion of the container. These ribs enable the receptacle to be blown at a reduced weight.

Figures 5(a) and 5(b) illustrate still another modification in the techniques heretofore illustrated. In Figure 5(a), ring member 12 contains no means for imparting axially extending grooves but consists of a conventional opening which imparts a smooth finish to the outer wall of the parison 20. Tip 11, on the other hand, imparts a series of circumferentially spaced, axially extended grooves 21 to the inner wall of the parison 20. Referring now to Figure 5(b), it can be seen that by advancing the mandrel in an axially downward direction relative to the orifice of the ring member, tip member 11 will no longer impart grooves to the inner wall of the parison, as illustrated at 22. Thus, through the use of a ring and tip arrangement such as that illustrated in Figures 5(a) and 5(b), a parison may be extruded having axially spaced ribbed portions at selected intervals along the inner wall of the parison.

When the tip 11 is positioned so that outermost tip portion 19, which is of a generally grooved cross sectional configuration, cooperates with the circular orifice defining ring portion 23, a parison cross sectional configuration as shown in Figure 13 results when plastic is extruded. After extruding a section of the parison having a cross section as shown in Figure 13, the tip 11 may then be lowered so as to cause the intermediate portion 24 which has a smooth surface to cooperate with the orifice defining ring portion 23. With this tip positioning, there would be extruded a parison portion having a cross sectional configuration as shown generally in Figure 14. Should it be desired to extrude a parison having an enlarged inside diameter, the tip member 11 may be further lowered to cause the inner tip portion 25 to cooperate with the orifice defining ring portion 23. The enlarged size of this portion of the tip in relation to the intermediate tip portion 24 would cause an increase in the parison inside diameter. This manner of varying the inside diameter of a parison, as well as a means for imparting reciprocal axial motion to the mandrel is more fully described in British Patent No. 1,068,337, and the various means described therein for imparting reciprocal axial motion to a mandrel are incorporated herein by reference. Obviously, this invention is not limited to any particular method of varying the geometry of the extrusion outlet to impart an alternate sequence of grooves and smooth areas to the internal walls of the parison.

The above described manner of selectively varying the inner wall geometry of a parison to provide alternate grooves and smooth sections opens up numerous possibilities in designing a receptacle or other hollow body. For example, the container may be formed having ribs extending only on a selected portion of a container or a hollow body may be produced having a sequence of alternate grooves and smooth sections. Numerous other variations will readily occur to one skilled in the art.

Figures 8—12 illustrate additional modifications which will impart other optical effects to the physical container as well as providing structural strength at any desired point along the receptacle. Obviously the ring and tip members will be varied with respect to the depth of groove and the shape and position of the ridges along the periphery of their respective members to correspond to the desired shape in the parison as it emerges from the extrusion outlet.

Figures 8 and 9 illustrate embodiments wherein the rib portions extend only partly around the parison. Figure 10 illustrates an embodiment wherein the grooves are of unequal depth around the periphery of the parison, while Figure 11 illustrates a parison in which the ridges are unequally spaced around the periphery of the parison. Figure 12 illustrates a parison in which the distance between the grooves from trough to trough varies around the perimeter of the parison. Many other modifications will readily occur to one skilled in the art.

One of the principle attributes of this unusual technique resides in the previously mentioned observations that receptacles produced in accordance with this invention possess an unusual optical effect caused by the variation in wall thickness at different intervals in the final article. Depending upon the particular shape of the receptacle formed within the mold, the ribs tend to flatten out at areas in which the parison is stretched to accommodate the wider portions of the mold. Accordingly, since the light is reflected through different angles at different sections of the receptacle, a visual effect is created which tends to produce an illusion of colour shading.

The structurally simple mechanism for producing these receptacles is of considerable importance. Its operation may be effected with only nominal modifications of existing extrusion equipment by simply replacing the conventional tip member and/or ring member with one having the desired axial protrusions. A particularly significant advantage attributable to this invention is that no modification need be made in the conventional blow molding equipment to produce these receptacles. Accordingly, the expenses involved in providing new molds to produce bottles or re-

ceptacles having a new and unusual finish are obviated.

The value of the additional strength in the walls of the container by the placement of vertical ribs positioned at set intervals is apparent, as is the advantage of producing a bottle at a reduced weight.

Obviously many variations in the method and apparatus disclosed will become apparent to one skilled in the art. For example, it is possible to vary the internal and external shape of the parison to produce, for example, an oval shaped parison rather than one of generally circular configuration. In addition, many other blow molding techniques may be employed in extruding a parison into the shape of a container, such as those illustrated in U.S.A. Patents Nos 3,272,896 and 3,303,249.

While the methods and apparatus disclosed in the invention have been described with reference to preferred embodiments, additional modifications will readily occur to those skilled in the extruding arts. For example, a plasticizing structure other than the structure schematically illustrated may be employed. Additionally, depending upon the particular parison shape desired, the extrusion outlet may assume other shapes which will impart a rib-like effect to the parison. For example, grooves may be imparted to the parison by pins or other projections extending from the ring or tip.

In addition, relative changes in the position of the tip and ring may be accomplished by movement of the ring rather than the tip, if desired. It is also possible to produce alternate grooved and smooth sections on the outer wall of the parison, as well as the inner wall of the parison.

Other modifications will readily occur to practitioners which would be well within the scope of the invention as defined in the appended claims.

WHAT WE CLAIM IS:—

1. A method of extruding a parison exhibiting a rib-like effect, said method comprising:

applying pressure to a mass of plastic material to cause its flow through a cavity and an extrusion outlet communicating with said cavity; said extrusion outlet including an orifice defining member, and a tip member and causing said plastic material to emerge from said extrusion outlet as a tubular formation having circumferentially spaced axially extending grooves.

2. A method according to claim 1 wherein said circumferentially spaced, axially extending grooves are positioned along the outer periphery of said tubular formation.

3. A method according to claim 1 wherein said circumferentially spaced, axially extending grooves are positioned along the inner periphery of said tubular formation.

4. A method according to claim 1 wherein said circumferentially spaced, axially extending grooves extend only along selected portions of said tubular formation.

5. A method according to claim 1, including the steps of introducing said tubular formation into a mold and molding said tubular formation into a resilient article.

6. A method according to claim 1 wherein said tubular formation is thereafter molded in the shape of a receptacle by the steps of closing a mold about said tubular formation while pinching in the joint thereof the exteriorly projecting portion of said tubular formation, and blowing the pinched tubular formation into the shape of a cavity within said mold.

7. An apparatus for carrying out the method claimed in any of the preceding claims and for forming a tubular formation of plastic material having circumferentially spaced axially extending grooves, said apparatus comprising:

a source of plastic material; an extrusion outlet including an orifice defining member containing means for imparting circumferentially spaced, axially extending grooves to said plastic material, and a tip member; a cavity including an open passage means connecting said source and said outlet; and means for causing said plastic material to flow through said cavity and through said extrusion outlet, thereby forming a parison.

8. An apparatus as recited in claim 7 wherein said tip member contains means for imparting circumferentially spaced, axially extending grooves to the inner periphery of said plastic material.

9. An apparatus as recited in claim 7 wherein said means for imparting circumferentially spaced, axially extending grooves to said plastic material includes a series of spaced protrusions positioned within said orifice defining member.

10. An apparatus as recited in claim 7, including severing means adapted to move transversely across the outer end of said cavity to sever an extruding tubular formation.

11. An apparatus for extruding plastics material to form a tubular parison, in accordance with the method claimed in any of claims 1 to 6 said apparatus comprising:

outlet means defining an opening containing circumferentially spaced, axially extending grooves therein; and means for extruding plastic material in the form of a tubular parison through said outlet.

12. An apparatus according to claim 11 wherein said circumferentially spaced axially extending grooves are of varying depth and width.

13. An apparatus for carrying out the method claimed in any of claims 1 to 6 and for forming a tubular formation of plastics material having circumferentially spaced axially extending grooves, said apparatus comprising:

a source of plastic material; an extrusion outlet including a tip member containing means for imparting circumferentially spaced, axially extending grooves to said plastic material and an orifice defining member; a cavity including an open passage means connecting said source and said outlet; and means for causing said plastic material to flow through said cavity and through said extrusion outlet, thereby forming a parison.

14. An apparatus as recited in claim 13 wherein said tip member is mounted for reciprocating axial movement relative to the orifice defining member; said tip member including a portion for imparting a smooth surface to said plastic material.

15. An apparatus as recited in claim 13 wherein said means for imparting circumferentially spaced, axially extending grooves to said plastic material includes a series of spaced protrusions positioned along said tip member.

16. A container when made in accordance with the method claimed in any of claims 1 to 6 and formed of a flexibly resilient plastic material, said container being characterized by a series of spaced, rib-like grooves.

17. A receptacle when made in accordance with the method claimed in any of claims 1 to 6 and formed of a flexibly resilient synthetic plastic material and comprising a top wall having an opening defined by upstanding tubular neck, a bottom wall and a side wall, said container being characterized by a series of rib-like circumferentially spaced grooves.

18. A receptacle as recited in claim 17 wherein said grooves extend from said upstanding tubular neck to said bottom wall.

19. A container as recited in claim 16 wherein said spaced rib-like grooves are of varying depth.

20. A container as recited in claim 16 wherein said spaced rib-like grooves are of varying width.

21. A container as recited in claim 16 wherein said grooves are unequally spaced.

22. A method of extruding a parison exhibiting a rib-like effect substantially as hereinbefore described with reference to the accompanying drawings.

23. A container when made in accordance with the method claimed in any of claims 1—6 substantially as hereinbefore described with reference to the accompanying drawings.

24. An apparatus for carrying out the method claimed in any of claims 1—6 substantially as hereinbefore described with reference to the accompanying drawings.

WITHERS & SPOONER,
Chartered Patent Agents,
148—150, Holborn,
London, E.C.1.
Agents for the Applicant.

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Sheet 1

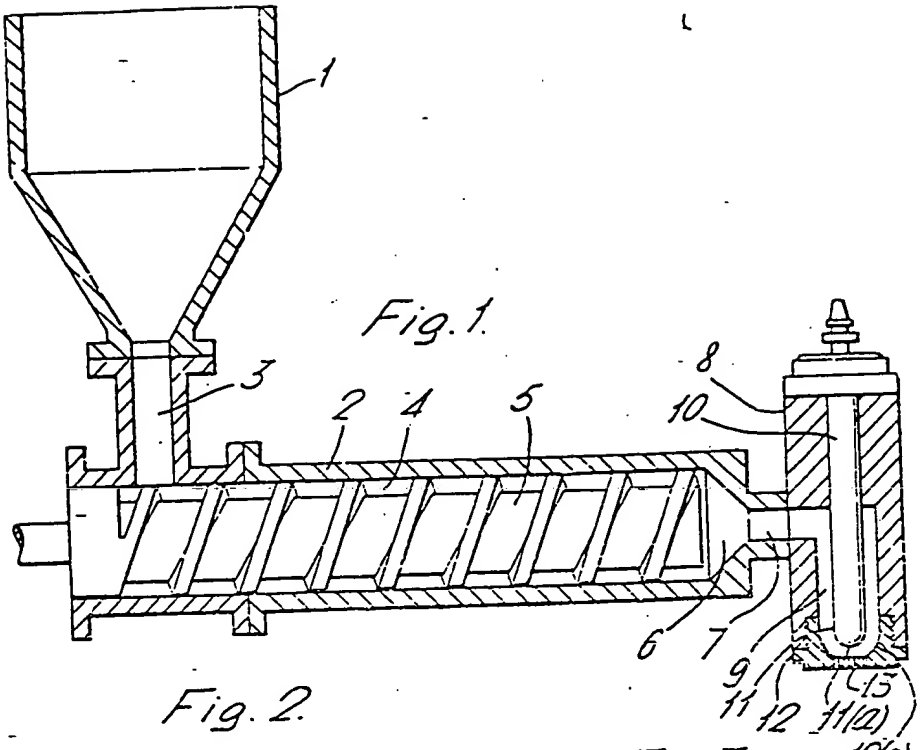

Fig. 1.

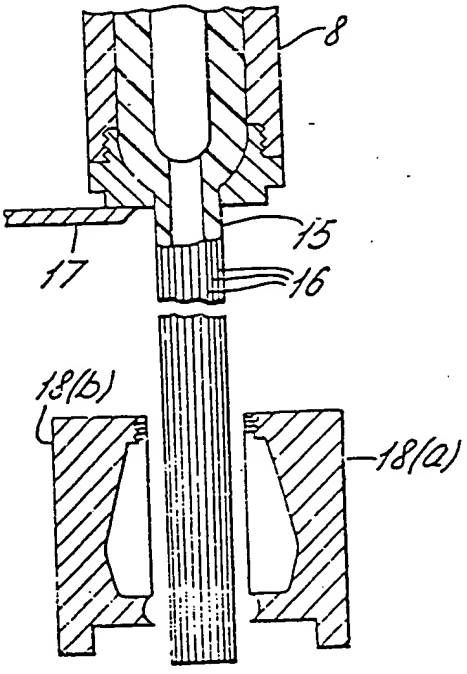

Fig. 2.

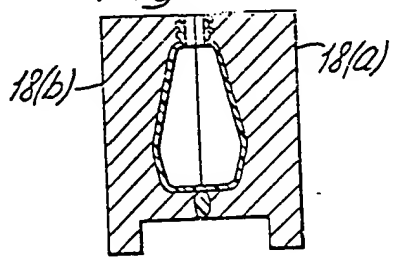

Fig. 3.

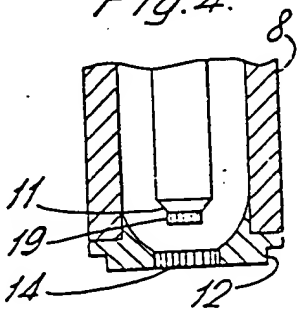

Fig. 4.

Fig. 5(a)

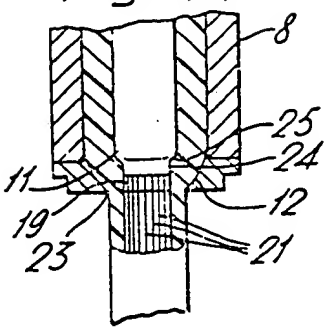

Fig. 5(b)

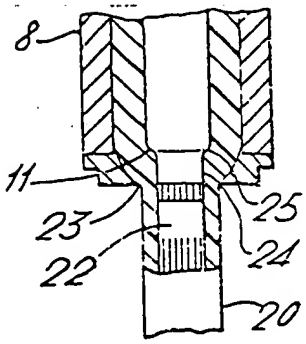

Fig. 13.

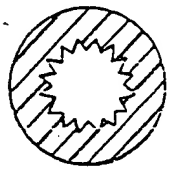

Fig. 14.

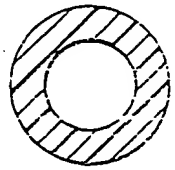

Fig. 6.

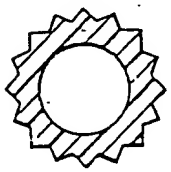

Fig. 7.

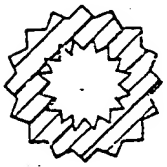

Fig. 8.

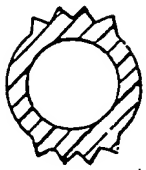

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Fig. 5(b)

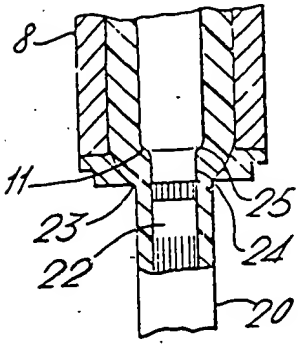

Fig. 9.

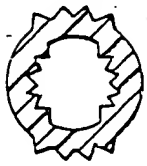

Fig. 11.

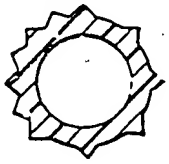

Fig. 10.

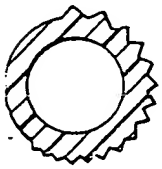

Fig. 12.

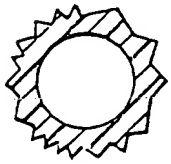

Fig. 14.

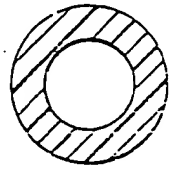

Fig. 15.

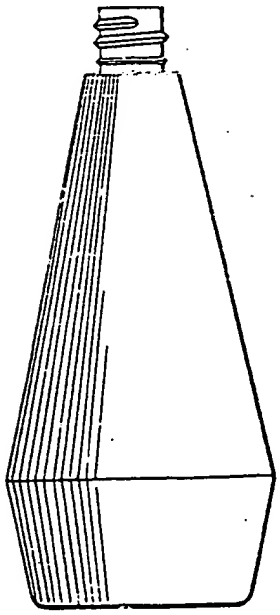

Fig. 7.